NON-PUBLIC?: N
ACCESSION #: 9006080273

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Byron, Unit 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000454

TITLE: Reactor Trip on Low-2 Steam Generator Level for Unknown Reasons During Troubleshooting on the Turbine Digital Electro-Hydraulic Computer
EVENT DATE: 05/03/90 LER #: 90-006-00 REPORT DATE: 06/01/90

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 79

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R. Hopkins, Operating Engineer TELEPHONE: (815) 234-5441 Ext. 2216

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JJ COMPONENT: XIS MANUFACTURER: X999
X JJ FU W120
X JJ FU W120
REPORTABLE NPRDS: N
N
N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On 5/03/90, at 0300, with Unit 1 operating at 79% power, the Operating Department began surveillance 1BOS 3.4.2.a-1, "Turbine Throttle, Governor, Reheat, and Intercept Valve Monthly Surveillance." At 0359, the surveillance was held to accommodate troubleshooting on the turbine Digital Electro-Hydraulic Computer (DEHC). Due to the repeated failure of a 2 ampere fuse on 1 of 4 loops on power supply card C1-H35, the turbine runback pushbutton was removed to prevent a runback signal. As the surveillance continued, all indication on the DEHC panel was lost.

The 5 ampere fuse on the same card was blown. As a replacement fuse was inserted, a 100 Megawatt power excursion occurred, followed by a complete load rejection. At 0631, a reactor trip occurred on Low-2 Steam Generator Level.

The 2 ampere fuse failed due to a short circuit in the pushbutton. The button was equipped with a grounded copper screen. When the button was moved inside the socket, the screen came in contact with the pushbutton light's power supply which induced a short and blew the fuse. The root cause for the 5 ampere fuse failure and subsequent reactor trip remain indeterminate.

As corrective action, the screens in all the pushbuttons were removed. The lighting circuit was also rewired to be made separate from the runback circuitry so a loss of indication will not effect a runback signal.

This event is reportable per 10CFR50.73 (a)(2)(iv) for an event that resulted in an automatic actuation of an Engineered Safety Feature, including the Reactor Protection System.

(0585R/0065R)

END OF ABSTRACT

A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 5/03/90 / 0631

Unit 1 MODE 1 - Power Operation Rx Power 79%
RCS AB! Temperature/Pressure Normal Operating

B. RESCRIPTION OF EVENT:

On 05/03/90, at 0300, with Unit 1 at approximately 79 percent reactor power and 1000 Megawatts (MWe), the Unit Nuclear Station Operator (NSO licensed) started 1 BOS 3.4.2.a-1, "Turbine Throttle, Governor, Reheat, and Intercept Valve Monthly Surveillance." During the previous two executions of the surveillance (on 4/29/90 and 4/30/90), the unit experienced a turbine runback while testing the turbine governor valves. (In-house Deviation Investigation Report 6-1-90-073 documents these events). As a result, Operational Analysis Department, Technical Staff, and Westinghouse personnel were present during the test to troubleshoot the turbine Digital

Electro-Hydraulic Computer (DEHC) JJ! during valve testing.

Troubleshooting and analysis of the last execut
ons of the
surveillance indicated the runback signal was being generated through one of the three runback inputs into the turbine DEHC. The signal was initiated due to a blown two ampere (amp) fuse on one loop of a 7300 series Quad Loop (NQP) power supply card in the DEHC computer location C1-H35. To prevent the unit from running back during the performance of the surveillance, the procedure had been temporarily changed to bias the stopping points for the turbine runback signal to higher values.

At 0359, while opening Governor Valve number 1, the fuse on the same DEHC power supply card blew. The DEHC panel Open and Close pushbutton status lights went out and a turbine runback signal was received. With the DEHC in Operator Auto, the unit ran back approximately 60 Megawatts. The NSO transferred the DEHC to Manual mode, stopping the runback. The plant was stabilized and the valve under test was reopened using the DEHC panel pushbuttons and the DEHC was returned to the Operator Auto mode.

To prevent any additional runback signals from being generated, the panel's turbine runback pushbutton was removed. The blown fuse was replaced and the surveillance was restarted. Again, while opening Governor Valve number 1 the two amp fuse on the same power supply card blow. No runback signal was generated and the test continued without light indication for the DEHC Open and Close pushbutton status lights. Governor Valves 1 and 3 were then successfully tested.

To measure the current drawn by the circuit during the test, an &meter was installed across the blown two amp fuse as Governor Valve number 2 was being closed. While opening the valve, the five amp fuse upstream of the blown two amp fuse which protects all four loops on card C1-H35, also blew and all light indication on the DEHC panel was lost.

At 0631, the 5 amp fuse was removed and a new fuse was inserted into the card. As the new fuse was installed, the unit experienced a sudden 100 MWe load increase followed by a complete load rejection. The load rejection initiated a Steam Generator Low Low Level reactor trip.

The operators entered emergency procedure 1BEP-0, "Reactor Trip or Safety Injection." All systems responded as designed. Auxiliary

Feedwater (AF) BA! automatically started to maintain steam generator levels. Stable conditions were achieved at 0700, as Auxiliary Feedwater was secured and the Start Up Feedwater Pump was placed in service to maintain Steam Generator levels. The NRC Operations Center was notified of the event at 0859 via the Emergency Notification System per 10CFR 50.72 (b)(2)(ii).

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B. DESCRIPTION OF EVENT: (continued)

All actions taken by the operators were correct which minimized the severity of the event. There were no systems or components inoperable which contributed to the event. This report is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv) for any event or condition that resulted in an automatic actuation of an Engineered Safety Feature, including the Reactor Protection System.

C. CAUSE OF EVENT:

The initial runback was caused by a short circuit in the DEHC panel Open pushbutton which caused the two amp fuse on the NQP card to fail.

The Station installed a replacement DEHC panel during the recent refueling outage (B1R03). Some of the new panel's pushbuttons were equipped with a grounded copper screen designed to eliminate radio frequency interference. The Open pushbutton was equipped with this screen. When the pushbutton was moved inside the socket, the screen in the Open pushbutton came into contact with the pushbutton light's 26 volt positive power supply. This induced a short circuit which blow the two amp fuse for the pushbutton status light.

During a normal valve test, the Open and Close pushbutton status lights illuminate when the close signal for the valve under test has decreased enough to switch a comparator circuit. When the comparator switches, it brings in a ground on one side of the light to complete a circuit and turn the Open and Close lights on. When the valve is returned to its original position the comparator turns off, removes the ground, and the lights go off.

The turbine runback pushbutton was also installed as a modification during B1R03. When depressed, the runback button would cause a transistor to switch sending a logic low signal to the DEHC

computer. A normal (no runback) signal was also provided to the computer through the pushbutton status lights. The power supply for the runback status light is the same as the Open and Close pushbuttons on the panel. When the valve test was in progress, the Open and Close lights had 26 volts on one side and ground on the other. As the fuse blew, the potential on both sides of the Open and Close pushbuttons and the potential at the runback pushbutton was pulled to ground through the valve test comparator circuit. The ground at the runback pushbutton generated a low at the computer which indicated a runback request.

In anticipation of receiving the runback signal during the surveillance, the stopping points for the runback with the DEHC in Automatic and Manual made were biased higher. The stopping point for the DEHC in the Automatic mode was a software adjustable value. The value was increased to 100 Megawatts above the value at the time of the test. When the runback signal was initiated, the DEHC Impulse Pressure feedback loop was rejected as expected. With no feedback in service, the DEHC recalculated the expected Megawatt value based on valve position. The now reference value was approximately 80 Megawatts above the runback stopping point entered into the computer. As a result, the DEHC ran the unit back. As the value for the Manual mode had been raised to a point above the operational level the runback stopped when the Manual mode was selected.

The circuit in which the current was being measured had a second 2 amp fuse which was expected to blow if the current became excessive. For unknown reasons the 5 amp fuse which protects all four loops failed instead. Failure of the 5 amp fuse on the NQP card resulted in the loss of all DEHC panel indication.

The root cause of the blown 5 amp fuse and subsequent power excursion and load rejection remain indeterminant. The reactor subsequently tripped on low-2 steam generator level due to the shrink experienced after the load rejection. It is speculated that the insertion of the fuse caused a spike on the 26 volt power supply that is common to several 7300 series cards for DEHC. However, simulation of this event could not support this theory during subsequent troubleshooting.

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D. SAFETY ANALYSIS:

This event did not endanger the health or safety of the plant or public. The plant functioned per design. The reactor trip established a more conservative operating configuration. No safety systems were impaired.

E. CORRECTIVE ACTIONS:

Corrective action taken to prevent recurrence of this problem include rewiring of the turbine runback circuit and removal of the screens from the DEHC panel pushbuttons. The runback was rewired via minor change M6-1-90-649. The lighting circuit was made separate from the actual runback signal, so that loss of power to the lightbulbs would not cause a runback signal to be generated. The screens in all the pushbuttons on the panel were removed at the suggestion of the manufacturer.

With the unit off line, the DEHC simulator was connected to the DEHC and the conditions prior to the event were re-established. The 5 amp fuse was pulled, removing all power to the DEHC panel. The event was repeated many times and the response to reinstalling the fuse was varied. In some cases, the DEHC transferred to Manual, and in some cases it stayed in Automatic. Based on the conditions duplicated, it is suspected the DEHC transferred to Manual mode during the event. In support of this theory, time was lost on the printout which indicates the computer did stop and DEHC should have been in manual. Regardless, the signal to the turbine governor valves remained stable when the 5 amp fuse was replaced making the root cause for the load rejection indeterminate.

Due to past and recent troubles with DEHC, the Station will pursue additional technical training for personnel involved with DEHC. Action Item Record 454-225-90-124 tracks completion of this item.

F. PREVIOUS OCCURRENCES:

Several problems with the DEHC system have occurred recently. Problems with a failed fuse causing runbacks are documented in In-house Deviation Investigation Report 6-1-90-073. A historical event search identified a reactor trip that occurred during the same surveillance as documented in DVR 6-1-85-056 (LER 85-028). However, the turbine was manually tripped with turbine power greater than 10%, so the root causes are not the same.

Station Trend 90-011 had been identified on 5/01/90 due to the recent transients caused by DEHC. Trend 88-08 has previously

addressed DEHC problems involving failed servo valves.

SOER 84-6, "Reactor Trips Caused by Turbine Control and Protection System Failures," and O&MR 3935, "Two Consecutive Trips as a result of EHC Design Deficiency," are industry documents of similar nature as this event.

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G. COMPONENT FAILURE DATA:

MANUFACTURER NOMENCLATURE MODEL NUMBER MFG PART NUMBER

Electronic pushbutton - - - - 800-A1C1E4-J3-
Technology L2N1(W)-12
Systems, Inc.
Westinghouse 2 ampere fuse - - - - 669A699H05
Westinghouse 5 ampere fuse - - - - 743A407221

RESULTS OF NPRDS SEARCH:

The DEHC system is not reportable to Nuclear Plant Reliability Data System (NPRDS).

(0585R/0065R)

Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

May 30, 1990

Ltr: BYRON 90-0497

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Dear Sir:

The enclosed Licensee Event Report from Byron Generating Station is being

transmitted to you in accordance with the requirements of
10CFR50.73(a)(2)(iv).

This report is number 90-006; Docket No. 50-454.

Sincerely,

R. Pleniewicz
Station Manager
Byron Nuclear Power Station

RP/jr

Enclosure: Licensee Event Report No. 90-006

cc: A. Bert Davis, NRC Region III Administrator
W. Kropp, NRC Senior Resident Inspector
INPO Record Center
CECo Distribution List

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